Product Review

Yaesu FTDX10 MF/HF and 6-Meter Transceiver

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Yaesu made a splash in the higher-end transceiver market a few years ago with the introduction of the FTDX101D/MP, a radio widely praised for its outstanding receiver performance. In 2020, Yaesu announced another new model: the FTDX10. This one is designed to compete in the intermediate-price class.

With the FTDX10, Yaesu has made superb receiver performance available at a lower price point and has incorporated a number of intriguing features to go along with it.

The Basics

The FTDX10 comes in an attractive enclosure about 3½ × 10½ × 10½ inches, weighing a somewhat hefty 13 pounds. As with most 100 W transceivers, you'll need to add a dc power supply capable of providing 20 – 25 A when the radio is transmitting.

Transmit frequency coverage includes all amateur bands from 160 through 6 meters, with five preset CW and SSB channels on 60 meters. Receive coverage is continuous from 30 kHz through 75 MHz, with performance specified for the amateur bands. Operating modes include AM, FM, SSB, CW, and digital, with built-in decoders for CW, RTTY, and PSK31.

The FTDX10 arrives with a programmable handheld microphone, a dc power cable, and a printed manual that is about ¼ inch thick. Unlike so many transceiver packages these days, you won't be required to down-

Bottom Line

Yaesu's FTDX10 brings their hybrid receiver architecture and excellent performance to the mid-priced market. The transceiver is packed with features for operators interested in any aspect of amateur radio.

load PDF manuals; Yaesu has thoughtfully provided everything in a single paper publication.

That said, you will need to download driver software if you want to connect the FTDX10 to your computer. More about that later.

Front and Back

The front panel of the FTDX10 is dominated by a 5-inch TFT color touchscreen (see Figure 1) and a large VFO knob. Most of the remaining buttons and other controls are clustered around the VFO, along with a row of LED indicators above.

On the opposite side, there is the **ON/OFF** switch, the **TUNE** button (which triggers the operation of the built-in antenna tuner), a 3.5-millimeter headphone jack, and an RJ-45 modular-type microphone jack instead of the eight-pin round connector typically found on HF transceivers. The front panel also includes a slot for an SD memory card.

The rear panel is adorned with an impressive collection of connectors (see Figure 2). Note that the FTDX10 has a single antenna port (SO-239) and no provision for using a separate low-noise receive antenna, such as a Beverage or small loop. Other than the dc power jack, the rest of the ports are devoted to connecting a variety of external devices:

- A six-pin DIN jack is used for external digital-mode hardware for RTTY, PACTOR, packet, or other modes.
- An eight-pin DIN jack is compatible with an optional Yaesu FC-40 external antenna tuner.
- A 10-pin DIN jack includes linear amplifier connections (relay control and ALC for any amplifier, plus band data and other signals for Yaesu's VL-1000 amplifier). Separate phono jacks for amplifier relay control and ALC would be more convenient.
- The FTDX10 sports a total of three USB ports. There is a USB-B jack for computer-aided transceiver (CAT) communication, transmit/receive switching, and audio data, plus two USB-A jacks for a keyboard and a mouse. Keyboard functionality shouldn't be confused with the keypad-entry feature; it has a jack all its own.
- I was surprised to see a DB-9 RS-232 port for computer interfacing, because virtually all computer peripherals interconnect with USB lines these days. If you are using an older computer at your station, however, this jack will be a welcome sight.

Figure 1 — The FTDX10 features a highly customizable 5-inch color touchscreen.

Figure 2 — The FTDX10 rear panel has connections for a variety of accessories. There is only one antenna jack, and no provision for a separate receive antenna. Note that the fan cycles on and off at slow speed in receive.

- If you prefer your transceiver display king-sized, there is a DVI-D port to connect to an external monitor. Like the RS-232 jack, this one is a bit of an oddity because virtually all modern monitors have HDMI ports, dispensing with DVI entirely. If you own an HDMI-only monitor, you can purchase DVI-to-HDMI converters for less than $10.

Rounding out the back panel, you'll find the usual CW key and external speaker jacks. One notable item that's missing is an ethernet port for connecting the transceiver to a computer network. If you want to wire the FTDX10 for use on a network, such as for internet remote control, you'll need to purchase the Yaesu SCU-LAN10 interface (which was reviewed in the May 2021 issue of *QST*) and attach it to the rear-panel accessory jack. (Note that the accessory jack is separate from the RTTY/data jack.)

Receiver Design

It's obvious from the outset that Yaesu designed the FTDX10's receiver with an eye to maximizing performance under challenging conditions. All ARRL Lab dynamic range tests produced excellent results, as seen in Table 1 and the Key Measurements summary graphic.

The FTDX10 has a sophisticated software-defined architecture but does initial signal processing using a hybrid approach. Received signals are first converted to 9 MHz and massaged in an analog stage that features three selectable roofing filters at 500 Hz, 3 kHz, and 12 kHz. These can be lifesavers in crowded conditions with strong nearby signals. A 300 Hz roofing filter is optional.

There are also two preamplifiers that can be particularly helpful on the higher frequency bands. On the other hand, if the reception environment becomes too hot, you have a choice of several levels of attenuation that you can bring in-line instantly.

All this conditioning takes place before signals are downconverted to 24 kHz, where the direct-sampling software-defined stage goes to work. It's here that you reap the benefits of enhanced software processing. For instance, the digital-signal processing (DSP) feature shows its considerable strength with a *contour* function. By adjusting the contour, you can slightly modify the response to reduce specific interference without sacrificing too much of the quality of the signal you're trying to hear.

Of course, FTDX10 signal processing software includes a deep manual notch filter. The digital notch filter (DNF) can seek and destroy more than one interfering carrier, and even track changes in the frequencies of interfering signals.

Taken as a whole, the result is remarkable receiver performance that you notice the moment you turn on the radio. This performance is also quite malleable, meaning that the FTDX10's design gives you the ability to tailor the reception characteristics to your needs.

Connecting the FTDX10

Being enamored with digital modes and CAT control, my first task was to get my station computer talking to the FTDX10. The virtual COM port drivers are available for download from Yaesu, and it is best to install them in your PC before you plug a USB-B cable into the radio. The drivers create two virtual COM ports that you can identify by opening the Microsoft Windows Device Manager. For my computer, they happened to be COM 4 and COM 5. Of course, they will be different on other PCs. I jotted down the numbers and then started configuring my software applications.

The FTDX10 appears to use the lower-numbered COM port for CAT control. The default signaling rate in the radio is set to 38,400 baud. I configured my logging program to communicate on COM 4 at 38,400 baud, but immediately discovered that the FTDX10 was too new to be included in my software's drop-down menu. Fortunately, I selected FT-991 instead and found that it worked; apparently these radios speak the same CAT dialect.

When setting up my *WSJT-X* application, I encountered the same issue. Once again, the FT-991 selection worked. For transmit/receive keying in *WSJT-X*, I chose COM 5, and it was flawless. Transmit and receive audio was available through the familiar USB audio codec, but I quickly learned that I had to go into the FTDX10's data mode menus and make sure that **REAR SELECT** was set for USB. If you fail to do this, you won't be able to get audio data into or out of the FTDX10 via the USB port.

I encountered an interesting situation while configuring the FTDX10 for RTTY contesting with *WriteLog,* my contest application of choice. *WriteLog* has a built-in RTTY send/receive module, known as *RTTYRite*. For years, I've operated my transceiver with *RTTYRite* using FSK — frequency-shift keying — so that I didn't have to worry about overmodulating the radio. With FSK, the computer sends only MARK/SPACE data to the radio, and the radio generates the corresponding MARK/SPACE RF signals. The alternative is AFSK — audio frequency-shift keying — where the computer generates MARK/SPACE audio tones that are applied to the audio input of the transceiver.

The FTDX10 manual states that the radio supports FSK for RTTY, which it does, but it required some experimentation to determine the correct settings that would be compatible with my software. In the FTDX10's **RADIO SETTING** menu, I had to access **MODE RTTY**, and then **RPTT SELECT**. I chose RTS for keying, but there wasn't a choice for which signal line the radio would use for the FSK data from my PC, and the manual was silent on this topic. I crossed my fingers, hoped the default was DTR, and then configured *RTTYRite* accordingly.

It took a combination of my experience with other radios, and a fair amount of trial and error, to finally resolve these computer entanglements. This is an area in which the manual isn't terribly useful; some additional text and illustrations would have been helpful. Just clarifying the terminology would ease some confusion.

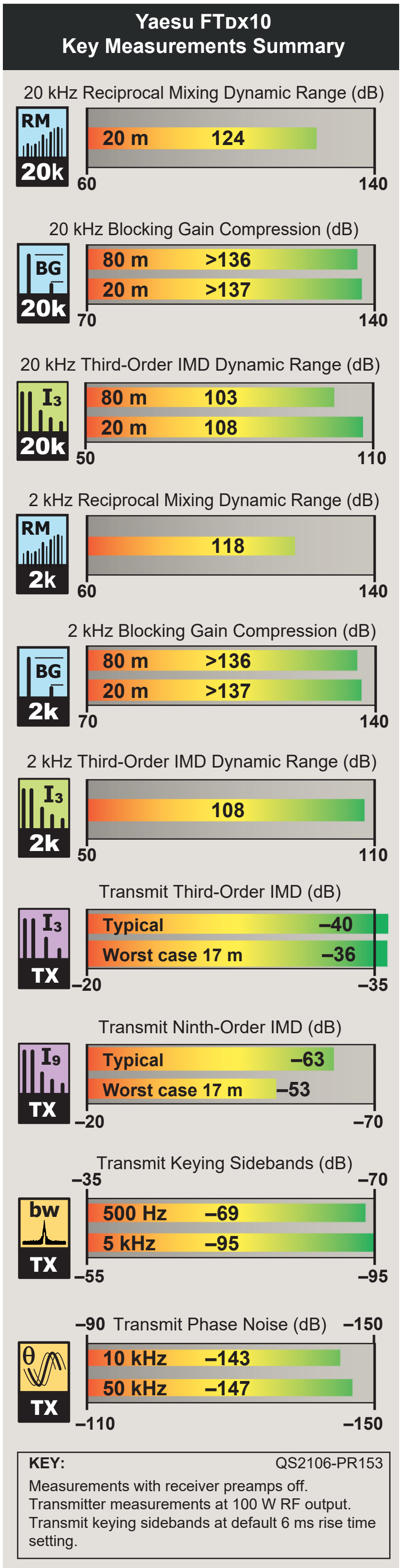

Table 1
Yaesu FTDX10, serial number 0N010008, V01-01

Manufacturer's Specifications	Measured in the ARRL Lab
Frequency coverage: Receive, 0.030 – 75 MHz. Transmit, 1.8 – 54 MHz (amateur bands only).	Receive and transmit, as specified. Five CW and five SSB memory channels programmed for 60-meter operation.
Power requirements: 13.8 V ±15%. Receive, 2.5 A with no signal, 3 A with signal present. Transmit, 23 A at 100 W RF output.	At 13.8 V dc: Receive, max. brightness, max. volume, no signal, 2.22 A. Transmit, 16.0 A (typical) at 100 W RF output; 6.5 A at 5 W output. No change in RF output at minimum specified supply voltage.
Modes of operation: SSB, CW, AM, FM, FM-N (FM narrow), RTTY, PSK, digital.	As specified.
Receiver	**Receiver Dynamic Testing**
SSB/CW sensitivity, 10 dB (S+N)/N, 2.4 kHz filter, preamp 2 on: 0.16 µV (1.8 – 30 MHz) 0.125 µV (50 – 54 MHz).	Noise floor (MDS), 500 Hz bandwidth: *Preamp* *Off* *P1* *P2* 0.137 MHz –107 –116 –110 dBm 0.475 MHz –117 –126 –127 dBm 1.0 MHz –120 –129 –132 dBm 3.5 MHz –127 –135 –138 dBm 14 MHz –127 –136 –139 dBm 50 MHz –130 –140 –142 dBm 70 MHz –126 –135 –138 dBm
Noise figure: Not specified.	Preamp Off/1/2: 14 MHz, 21/11/8 dB; 50 MHz; 17/7/5 dB.
AM sensitivity: 6 kHz BW, 10 dB (S+N/N), 30% modulation, 400 Hz tone: 7.9 µV (0.5 – 1.8 MHz, preamp off) 2.0 µV (1.8 – 30 MHz, preamp 2 on) 1.0 µV (50 – 54 MHz, preamp 2 on).	10 dB (S+N)/N, 1 kHz tone, 30% modulation, 6 kHz BW: *Preamp* *Off* *P1* *P2* 1.02 MHz 6.45 2.16 1.66 µV 3.88 MHz 2.63 0.86 0.62 µV 29.0 MHz 1.40 0.52 0.49 µV 50.4 MHz 1.55 0.51 0.49 µV
FM sensitivity: 12 dB SINAD, 12 kHz BW, 3.5 kHz deviation, preamp 2 on: 0.25 µV (28 – 30 MHz) 0.20 µV (50 – 54 MHz).	For 12 dB SINAD, 3 kHz deviation, 12 kHz BW: *Preamp* *Off* *P1* *P2* 29 MHz 0.58 0.21 0.19 µV 52 MHz 0.69 0.23 0.20 µV 70 MHz 1.01 0.32 0.24 µV
Spectral display sensitivity: Not specified.	Preamp off/P1/P2: Panadapter and waterfall, –106/–114/–124 dBm; 3DSS, –111/–119/–128 dBm.
Blocking gain compression dynamic range: Not specified.	Blocking gain compression dynamic range, 500 Hz BW:* *Preamp* *20 kHz offset Off/P1/P2* *5/2 kHz offset Preamp off* 3.5 MHz >136/145/138 >136/>136 dB 14 MHz >137/147/140 >137/>137 dB 50 MHz 140/141/136 140/140 dB
Reciprocal mixing dynamic range: Not specified.	14 MHz, 20/5/2 kHz offset: 124/122/118 dB.

ARRL Lab Two-Tone IMD Testing (500 Hz bandwidth)

Band/Preamp	*Spacing*	*Measured IMD Level*	*Measured Input Level*	*IMD DR*
3.5 MHz/Off	20 kHz	–127 dBm	–24 dBm	103 dB
		–97 dBm	–9 dBm	
		–65 dBm	0 dBm	
14 MHz/Off	20 kHz	–127 dBm	–19 dBm	108 dB
		–97 dBm	–9 dBm	
		–66 dBm	0 dBm	
14 MHz/P1	20 kHz	–136 dBm	–28 dBm	108 dB
		–97 dBm	–15 dBm	
14 MHz/P2	20 kHz	–139 dBm	–35 dBm	104 dB
		–97 dBm	–21 dBm	
14 MHz/Off	5 kHz	–127 dBm	–19 dBm	108 dB
		–97 dBm	–9 dBm	
14 MHz/Off	2 kHz	–127 dBm	–19 dBm	108 dB
		–97 dBm	–9 dBm	

Manufacturer's Specifications		Measured in the ARRL Lab		
50 MHz/Off	20 kHz	–130 dBm –97 dBm	–29 dBm –19 dBm	101 dB
50 MHz/P2	20 kHz	–142 dBm –97 dBm	–46 dBm –31 dBm	96 dB

Manufacturer's Specifications	Measured in the ARRL Lab
Second-order intercept point: Not specified.	Preamp Off/P1/P2 14 MHz, +87/+77/+77 dBm 21 MHz, +91/+81/+81 dBm 50 MHz, +81/+75/+75 dBm
FM adjacent channel rejection: Not specified.	P2 on: 29 MHz, 84 dB; 52 MHz, 84 dB.
FM two-tone third-order IMD dynamic: range: Not specified.	20 kHz offset, P2 on: 29 MHz, 84 dB;† 52 MHz, 84 dB.† 10 MHz offset, P2 on: 29 MHz, 99 dB; 52 MHz, 95 dB.
IF rejection: Not specified.	IF rejection: 7 MHz, 76 dB; 10.1 MHz, 69 dB; 14 MHz, >99 dB; 50 MHz, >141 dB.
Image rejection: ≥70 dB (1.8 – 29.7 MHz), ≥60 dB (50 – 54 MHz).	Image rejection: 7 MHz, 90 dB; 10.1 MHz, 92 dB; 14 MHz, 86 dB; 50 MHz, 70 dB.
DSP noise reduction: Not specified.	Adjustable, 5 to 15 dB.
Notch filter depth: Not specified.	Adjustable manual notch, 5 to 70 dB.
S-meter sensitivity: Not specified.	S-9 signal, preamp Off/P1/P2: 14 MHz, 97.6/33.9/12 µV; 50 MHz, 54.9/18.2/7.32 µV; Scaling: 3 dB per S-unit.
Squelch sensitivity: Not specified.	At threshold/maximum level, FM, P2 on: 29 MHz, 0.18/0.38 µV; 52 MHz, 0.2/0.4 µV. 14 MHz SSB, preamp off, 12 – 130 µV.
IF/audio response: Not specified.	Range at –6 dB points:‡ CW (500 Hz BW): 450 – 950 Hz; Equivalent Rectangular BW: 497 Hz; SSB (2.4 kHz BW): 360 – 2510 Hz; AM (6 kHz BW): 330 – 2980 Hz.
Audio output: 2.5 W into 4 Ω at 10% THD	As specified. THD 0.25% at 1 V_{RMS}.
Receive processing delay time: Not specified.	21 ms.
Transmitter	**Transmitter Dynamic Testing**
Power output: 5 to 100 W (AM, 5 to 25 W).	HF, as specified; 50 MHz, 5 to 95 W.
Spurious-signal and harmonic suppression: ≥50 dB (HF); ≥63 dB (50 MHz).	HF, >70 dB typical; worst case, 57 dB (30 m); 50 MHz, 70 dB. Complies with FCC emission standards.
Third-order intermodulation distortion (IMD) products: –31 dB at 14 MHz.	3rd/5th/7th/9th order, 100 W PEP: –40/–49/–57/–63 dB (HF typical) –36/–39/–43/–53 dB (worst case, 17 m) –37/–42/–51/–58 dB (50 MHz) At 50 W PEP RF output: –34/–40/–51/–55 dB (14 MHz) –42/–45/–55/–58 dB (50 MHz)
CW keyer speed range: Not specified.	4 to 56 WPM, iambic mode A, B, Y, semiautomatic (bug).
CW keying characteristics: Not specified.	See Figures A and B.
Transmit-receive turnaround time (PTT release to 50% audio output: Not specified.	S-9 signal, AGC fast, SSB: 48 ms; AGC fast, CW, full break-in: 70 ms.
Receive-transmit turnaround time (tx delay): Not specified.	SSB, 28 ms; FM, 15 ms (29 MHz), 16 ms (52 MHz).
Transmit phase noise: Not specified.	See Figure C.

Size (height, width, depth, including protrusions): 3.6×10.5×10.4 inches. Weight, 13 lbs.

Second-order intercept points were determined using S-5 reference.

"Preamp off" measurements are with the IPO (Intercept Point Optimization) setting.
*No blocking was observed with up to +10 dBm signal at the antenna jack, the maximum level used in ARRL Lab testing.
†Measurement was noise limited at the value indicated.
‡Default values; bandwidth is adjustable via DSP.

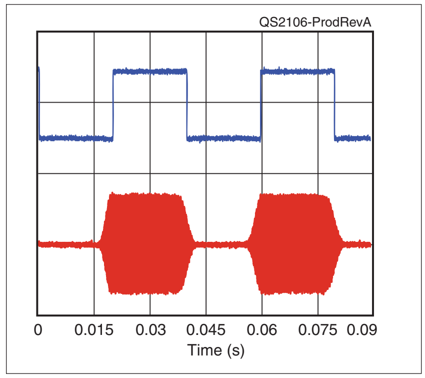

Figure A — The CW keying waveform for the Yaesu FTDX10, showing the first two dits in full-break-in (QSK) mode, using external keying and the default 6-millisecond rise time setting. Equivalent keying speed is 60 WPM. The upper trace is the actual key closure; the lower trace is the RF envelope. (Note that the first key closure starts at the left edge of the figure.) Horizontal divisions are 10 ms. The transceiver was being operated at 100 W output on the 14 MHz band.

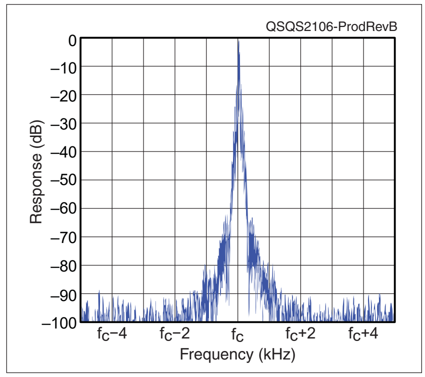

Figure B — The spectral display of the Yaesu FTDX10 transmitter during keying sideband testing. Equivalent keying speed is 60 WPM using external keying and the default 6-millisecond rise time setting. Spectrum analyzer resolution bandwidth is 10 Hz, and the sweep time is 30 seconds. The transmitter was being operated at 100 W PEP output on the 14 MHz band, and this plot shows the transmitter output ±5 kHz from the carrier. The reference level is 0 dBc, and the vertical scale is in decibels.

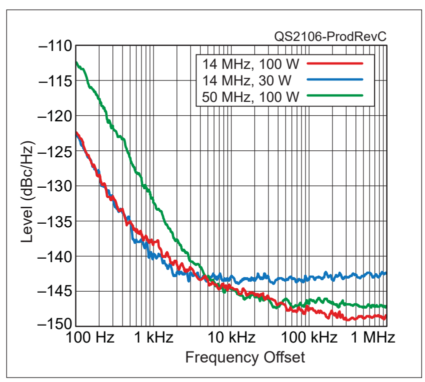

Figure C — The spectral display of the Yaesu FTDX10 transmitter output during phase-noise testing. Power output is 100 W on the 14 MHz band (red trace), 30 W on the 14 MHz band (blue trace), and 100 W on the 50 MHz band (green trace). The carrier, off the left edge of the plot, is not shown. This plot shows phase noise 100 Hz to 1 MHz from the carrier. The reference level is –110 dBc/Hz, and the vertical scale is 5 dB per division.

As I noted earlier, the other two USB jacks on the rear of the FTDX10 support a keyboard and mouse. Because the transceiver provides the ability to encode and decode RTTY and PSK31 signals, I thought I'd be able to use these ports and dispense with an external computer entirely. Alas, I discovered that the keyboard is only used for entering characters when needed, such as creating canned RTTY and PSK31 messages. You can't use the keyboard to engage in freeform chats. The mouse is still handy for menu access if you'd rather not poke at the touchscreen, or if you decide to display the screen on a separate monitor.

Having said all this, if you have no interest in CAT control or digital operating, these points are moot. If that is the case, just connect the coaxial cable feed line, the dc power supply, a microphone, and, if you use one, a key.

On the Air

Before taking the FTDX10 for another quick spin around the block, I thought it best to spend more time with the manual. I'm glad I did.

The FTDX10 offers a vast assortment of features, many of which have options within their functions. Operating the radio isn't a matter of simply toggling functions on or off. You are often faced with choices about how a given function should be configured. If you launch into a flurry of tweaking and button pushing without first understanding what you are doing, you run the risk of finding yourself thoroughly confused (and with the radio laboring under some odd settings). Should that happen to you, the manual helpfully describes the steps necessary to reset the radio to factory defaults.

Satisfied with my deeper dive into the manual, it was time again to apply power. The FTDX10's relays spring to life and the TFT display is always a marvel to behold. Selecting the 3DSS display mode, I'm treated to a mesmerizing three-dimensional field of signal spikes (see Figure 3). You can select a more traditional waterfall display, if you prefer, and even bring up inset displays for audio and more.

Picking at one minor nit, some pop-up screens, such as band selection, disappear if you don't make a choice within a couple of seconds. The radio soon trained me to think fast and not contemplate my options, but this was still an annoying behavior. It would be nice if all screens remained visible until you made your choice, however long that might take.

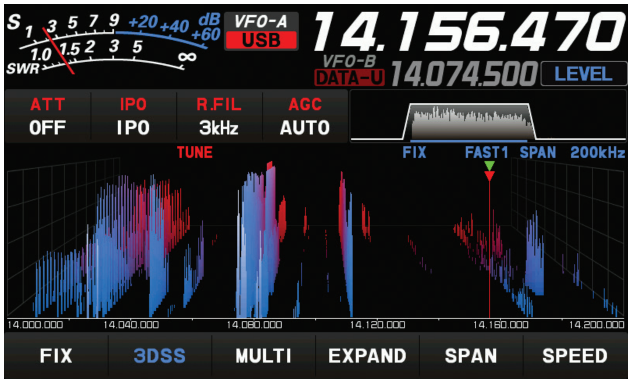

Figure 3 — The FTDX10's fascinating 3DSS display mode represents signals as receding spikes in constant motion. You can also opt for a more traditional waterfall display.

A smooth spin of the large VFO knob sent the cursor racing though the display. As I listened to SSB signals on 40 meters, the FTDX10's performance was striking. The band was crowded, which was just what I was hoping for, and I deliberately waded into intense interference, switching between roofing filters and manipulating the IF bandwidths. The transceiver did an amazing job of separating the garbage to the extent that it was technically possible, including interference from a couple of international broadcast signals.

As I adjusted the filtering, the results were displayed on a tiny inset window. This included the depiction of the DSP contour function and notch.

My initial foray into generating RF with the FTDX10 was on SSB, and I received outstanding audio reports. I also dared to dabble with the radio's parametric transmit audio equalizer while a friend listened to my signal. This is one feature that made me grateful for having read the manual. I alternated between giving the bass frequencies a boost and enhancing the crispness at the high end. The manual does a great job of explaining how the equalizer works.

Like most modern transceivers, the FTDX10 offers voice memories for use on AM, SSB, or FM. You can record up to five separate messages, each with a maximum time limit of 90 seconds, and then save them to the SD memory card for quick access. If you purchased Yaesu's FH-2 Remote Control Keypad, you could play back the recordings over the air with the press of a button. Otherwise, you must access the recordings from the screen.

You can also record received audio to the SD card, at least up to a maximum of 35 GB per file (that's a lot of audio). The recorded audio is saved in WAV format. I saved 60 seconds of audio from an SSB conversation on 20 meters, and that file occupied just under 3 MB on the card. I was using an 8 GB memory card, which would probably have been able to store more than 40 hours (total) of recorded audio.

Speaking of receive audio, the FTDX10 allows an impressive amount of flexibility when it comes to tailoring the frequency response. The adjustable receive audio filter provides an array of high- and low-cut frequency settings for each mode, including the digital modes. I found that tweaking this feature often made an enormous difference in intelligibility, especially when operating CW or SSB.

MPVD

Among the plethora of FTDX10 features, you'll find one with an unusual moniker: *multipurpose VFO outer dial*. No wonder they abbreviated it MPVD.

MPVD takes the form of an unassuming ring at the base of the VFO knob; it almost looks purely decorative at first glance. Move the ring without doing anything else, and you'll go zipping across the band at 10 times the frequency step that's set for the main knob. This is convenient when you want to change frequencies fast. But that's not the only trick the MVPD ring can do.

You can instantly change the function of the ring by pressing the **BAND**, **STEP**, **MODE**, **CLAR RX**, or **CLAR TX** buttons. By doing so, a ring that once sped through the bands can be abruptly commanded to do something completely different.

For example, let's say you are operating SSB at the top end of 15 meters but want to switch to CW and operate at the bottom of the band instead. Give the MPVD a few twists, and you'll find yourself many kilohertz lower than where you started. Now punch the **MODE** button, and when the mode menu appears, twist the ring again to select CW. It's that easy.

I tested this on 10 meters, using the MPVD to jump from operating AM at 29.200 MHz to running RTTY at 28.090 MHz. It took 15 seconds to slide more than a megahertz and switch modes in the bargain. Covering the same distance by spinning the VFO knob required 60 seconds, not including the time necessary to change modes.

And if that wasn't enough, you can configure the MPVD to adjust one of 16 separate custom functions. My favorite was CW sending speed. I assigned that function to the MPVD and greatly enjoyed increasing or decreasing the sending speed of the built-in keyer with just a flick of my fingers.

Lab Notes: Yaesu FTDX10

Bob Allison, WB1GCM, ARRL Lab Test Engineer

Receiver test data for the Yaesu FTDX10 indicates a high level of performance, only slightly lower than the FTDX101D and FTDX101MP. Blocking dynamic range is greater than 137 dB at 2 kHz spacing, for example. The actual blocking signal needed to reduce the volume of the desired signal exceeds +10 dBm, the highest level we use for testing in the Lab. Even at +10 dBm, there was no sign of overloading with the preamp off. During initial testing, the IMD dynamic range at 3.5 MHz measured lower than expected. Yaesu found a defective filter and repaired the radio under warranty. Table 1 reflects measurements after repair.

The FTDX10 receiver offers plenty of flexibility with its use of preamps and attenuation, if needed. Sensitivity at 50 MHz, where it's needed most, is excellent. AM sensitivity is also good, especially on 6 meters, where there seems to be a resurgence of AM activity. S-meter calibration is the same as other Yaesu models, using 3 dB per S-unit scaling.

Transmitter performance is very good. Transmit phase noise is low, especially at the 30 W level, an RF output level typically used for driving a linear amplifier. Transmit IMD products are reasonably low, too.

As with many of today's transceivers, CW bandwidth varies with the **CW RISE TIME** menu setting, where the user can select the rise/fall time of the CW waveform. With the original firmware, the FTDX10 menu offered choices of 1, 2, 4, and 6 milliseconds rise time, as found on other current Yaesu models. After reviewing data and comments from the ARRL Lab that showed wide keying sidebands with the 1- and 2-millisecond settings, Yaesu modified the firmware (Main V01-05) to eliminate the 1- and 2-millisecond settings, add an 8-millisecond setting, and change the default to 6 milliseconds. (The Lab measured the actual rise/fall times for these settings to be 2.7/3.9, 4.2/4.6 and 5.4/6.6 milliseconds for the 4-, 6-, and 8-millisecond menu settings.)

Figures A and B elsewhere in this review show the CW waveform and bandwidth using the default setting of 6 milliseconds. A document comparing the FTDX10's CW keying waveform and bandwidth at all three current settings is available from **www.arrl.org/qst-in-depth**. You can see that the transmitted bandwidth is good at all three settings and that the transmitted signal narrows as the rise time setting increases. We are very pleased that Yaesu made these changes.

For the best quality transmitted signal, the ARRL Lab recommends loading the Main V01-05 firmware and setting the **CW RISE TIME** in the **MODE CW** menu to 6 or 8 milliseconds. Note that this recommendation is not unique to the FTDX10 and applies to any transceiver with adjustable rise time settings. For more information on this topic, see "It's Time to Clean Up our Transmitters," by Rob Sherwood, NCØB, in the November 2019 issue of *QST*.

Overall, the FTDX10 is a delight to use, ready to take on the biggest signals if your antenna farm is up to it.

Automatic Antenna Tuner

The FTDX10's internal automatic antenna tuner is designed to handle impedance mismatches that result in SWRs of 3:1 or less at the antenna port. The tuner activates with a push of the **TUNE** button, and the relays chatter madly for a couple of seconds as it attempts to find a match. Assuming an acceptable match is found, the tuner then appears to track across a substantial range within the band, adjusting quickly as necessary each time you transmit on a new frequency.

I can't help but mention that the FTDX10's autotuner was more generous in its matching ability compared to the tuner in my own transceiver. In one instance, the FTDX10's tuner found a match with my antenna system at a frequency and impedance that my current radio's tuner stubbornly refuses to accept.

CW Operation

The FTDX10 is a highly capable CW contest rig, especially considering its receive performance. If I spent the time necessary to tweak the filtering and DSP functionality, I was able to copy virtually any CW signal. As I became more proficient, it was uncommon not to be able to isolate a signal sufficiently to render it comprehensible.

Full-break-in (QSK) and semi-break-in operation is supported. The transmit-receive switching uses relays, with the clicking sound barely audible with the speaker volume at normal listening levels. The rear-panel ¼-inch key jack can be set up for a paddle to use with the internal memory keyer or for use with an external keyer, computer keying, or other key. As with the voice memories, the CW keyer memories can be sent by using virtual buttons on the display or an optional FH-2 remote control keypad.

The transceiver offers a CW decoder, but I found that it falls short of even my diminished skills. Not only do you have to carefully tune the signal to the proper frequency, but you must also adjust a control to match the speed at which you think the other operator is sending. There is little margin for error, and the algorithm doesn't seem too flexible in terms of tracking speed changes. Unless you get the adjustment in the bullseye, you'll see only gibberish crawling across the screen. To be fair, however, decoding CW in software has always been hit or miss. Even the best applications have yet to match the decoder nestled between your ears.

I consistently received excellent CW signal reports. Just to hear the quality myself, I accessed an online receiver and listened to my own signal as I sent a series of Vs. Tuning above and below the signal, I didn't hear clicks or anything else out of the ordinary. See the "Lab Notes" sidebar for more information on CW settings.

Digital Modes

As I mentioned earlier, I was able to configure my digital software to work with the FTDX10 and subsequently enjoyed making several FT8, Olivia, and Contestia contacts.

The radio truly shined during the BARTG RTTY Sprint Contest in January 2021. At one point, the activity in the RTTY portion of 20 meters was wall to wall, yet thanks to the FTDX10's receiver, my software had little trouble decoding signals, including those bracketed by strong stations.

Switching to the FTDX10's built-in RTTY decoder, it performed substantially better than the CW decoder, but still fell short of the *MMTTY* software I normally use (see Figure 4). With its versatile message memories, the FTDX10 has the potential to do RTTY contesting without an external computer, but only if the decoding quality is improved.

As I also mentioned, the FTDX10 has built-in PSK31 capability. With the advent of FT8, PSK31 activity has decreased. Yes, there are still contacts to be had, but as with its built-in RTTY feature, the FTDX10 supports only canned PSK31 messages (macros), not freeform conversational exchanges. There was a time when, to the irritation of many PSK31 operators, macro exchanges were the norm, but today the remaining PSK31 enthusiasts are trending back toward casual

Figure 4 — During the BARTG RTTY Contest, the FTDX10's RTTY decoder tries to render readable text, but with mixed results. The passband display to the right of the AGC indicator shows mark and space frequencies to aid in tuning.

chatting. Without the ability to type and send freeform text within the FTDX10's PSK31 function, those conversations will still have to take place with an external computer and software.

The FTDX10's PSK31 decoder seemed superior to the RTTY decoder. Successfully tuning a signal requires practice, but once you hit the sweet spot, the decoder does a reasonably good job.

Conclusion

The Yaesu FTDX10 is well positioned for competitive performance, but at a competitive price. My wish list for future updates includes improved RTTY and CW decoding, and if possible, the inclusion of FT8. I think the design of the FTDX10 would be particularly well suited to this mode. The ability to send freeform text from a keyboard would also be welcomed.

Manufacturer: Yaesu USA, 6125 Phyllis Dr., Cypress, CA 90630; **www.yaesu.com**. Price: $1,700.